



Instruction manual

Please read this manual before installation and use.

GENERAL

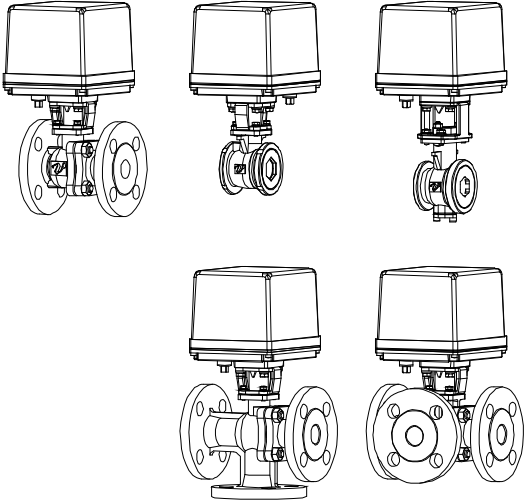
It composed of flange-end ball valve and high-power electric actuator. (proportional control)

Actuator

- AEX : For AC power.
- PEX : For AC / DC power.

Valve

- BR type For various fluids and general use.
- BS type For Wafer
- VR type For control
- GS type For Wafer. (JIS 10K / 20K)
- TR type For mixing / dividing.
- LR type For mixing / dividing.
- L3 type Trunnion structure. (L)



PRODUCT CODE

| | | | | | | | | | | | | | |
|---------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|---------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| BR type | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | - | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| BS type (Full port) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | - | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| (Standard port) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | R | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| VR type | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | - | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| (Standard port) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | R 0 1 5 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| GS type (V-port) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | V | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| (Full port) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | - | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| (Standard port) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | R | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| TR type | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | P | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| LR type | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | P | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| L3 type | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | G | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | | |

| | | | |
|---|---|---|--|
| (1) Actuator AEX PEX | (4) Sizing code 0 : Standard 1 : Light 2 : Heavy | (7) Ball material T : SCS13A / SUS304 U : SCS14A / SUS316 | (10) Option EA : Alarm output board EI : 4 to 20 mA Indication signal board L0 : Auxiliary limit switch L2 : Auxiliary limit switch |
| (2) Valve BR BS VR GS TR LR L3 | (5) Connection 1 : JIS 10K 3 : JIS 20K | (8) Seat material F : F-PTFE G : R-PTFE R : R-F-PTFE K : PEEK I : API C : R-PEEK M : SUS316 + Stellite P : R-PTFE | (11) Operation mode Nil : Mode A J : Mode B |
| (3) Voltage 1 : 100 / 110 V AC 2 : 200 / 220 V AC 6 : 100 to 240 V AC 0 : 24 V DC | (6) Body material T : SCS13A U : SCS14A | (9) Size [mm] ex. 25 A → 025 | (11) Input signal (AEX) It corresponds to various control input signals. |

VALVES SPECIFICATIONS

Water
 Oil
 Air, Gas
 Steam
 Chemicals
 Sea water
 Slurry
 Negative pressure

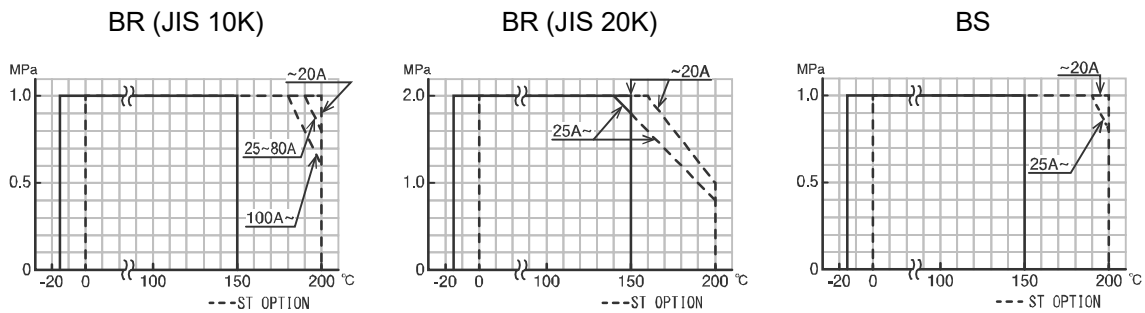
BR BS type

| | | | | | | | |
|--------------|---------|--------------------|--------------------|----------|-----------------|---------------|----------|
| Valve type | | BR | | | BS | | |
| Design | | 2-way, Full port | | | 2-way, Wafer | | |
| | | | | | Full port | Standard port | |
| Connection | | JIS10K Flanged-end | JIS20K Flanged-end | | JIS Flanges 10K | | |
| Fluid | | | | | | | |
| Max pressure | | 1 MPa | 2 MPa | | 1 MPa | | |
| Size [mm] | | 015 to 150 | 015 to 080 | | 015 to 80 | R100 to R150 | |
| Material | Body | SCS13A | SCS14A | SCS13A | SCS13A | SCS14A | SCS13A |
| | Ball | SCS13A SUS304 | SCS14A SUS316 | SCS13A | SCS13A | SCS14A | SCS13A |
| | Seat | F-PTFE | R-PTFE | R-F-PTFE | F-PTFE | R-PTFE | R-F-PTFE |
| Stem seal | Packing | R-PTFE | | | R-PTFE | | |
| | O-ring | FKM | | | FKM | | |

The optional for steam fluids.

| Valve type | Option code | O-ring |
|------------|-------------|-------------------------------|
| BR BS | ST | Replace (Steam resistant FKM) |

PRESSURE & TEMPERATURE RATING

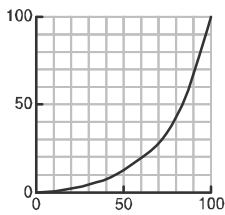


Note) Insulation options are required for use with fluids more than 150 °C.

INHERENT FLOW CHARACTERISTIC (BS)

R100 to R150 mm

Cv value (%)



Valve opening (%)

Range ability 30:1

VALVES SPECIFICATIONS

Water
 Oil
 Air, Gas
 Steam
 Chemicals
 Sea water
 Slurry
 Negative pressure

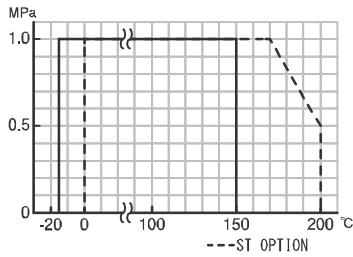
VR type

| | | | |
|--------------|--------------------|------------|-----------------|
| Valve type | VR | | |
| Design | 2-way, V-port | | |
| Connection | JIS10K Flanged-end | | |
| Fluid | | | |
| Max pressure | 1 MPa | | |
| Size [mm] | R015 | 015 to 080 | |
| | Material | Body | SCS14A |
| | | Ball | SUS316 SCS14A |
| | | Seat | R-PTFE R-F-PTFE |
| Stem seal | Packing | R-PTFE | |
| | O-ring | FKM | |

The optional for steam fluids.

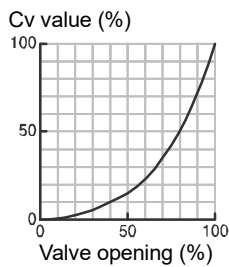
| Valve type | Option code | O-ring |
|------------|-------------|-------------------------------|
| VR | ST | Replace (Steam resistant FKM) |

PRESSURE & TEMPERATURE RATING



Note) Insulation options are required for use with fluids more than 150 °C.

INHERENT FLOW CHARACTERISTIC








Range ability

VR-1UUG R 015 100:1
 VR-1UUG - 015 to 080 50:1

VALVES SPECIFICATIONS

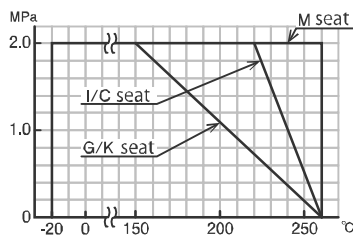
 Water
  Oil
  Air, Gas
  Steam
  Chemicals
  Sea water
  Slurry
  Negative pressure

GS type

| | | | | | | |
|--------------|---|---------------------|---------------|-----|--------|-------------------|
| Valve type | GS | | | | | |
| Design | 2-way, Wafer | | | | | |
| | V-port | Full port | Standard port | | | |
| Connection | JIS Flanges 10K / 20K | | | | | |
| Fluid |      | | | | | |
| Max pressure | 2 MPa | | | | | |
| Size [mm] | V015 to V032 | 015 to 080 | R040 to R150 | | | |
| | Material | SCS14A | | | | |
| | Ball | SCS14A (HCr plated) | | | | |
| | Seat | R-PTFE | PEEK | API | R-PEEK | SUS316 + Stellite |
| Stem seal | Packing | R-PTFE | | | | |

Note) API cannot be used with steam fluid.

PRESSURE & TEMPERATURE RATING

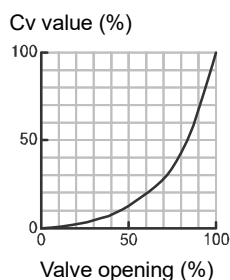


Note) • Option for use in fluid temperature more than 170 °C.
 • We prefer to K seat depends on pressure or environmental conditions. Please consult us for your specifications.

SEAT LEAKAGE VOLUME (JIS B 2005-4)

| | Seat material | Leakage rate | Remarks |
|---|----------------------------|---|---|
| G | R-PTFE | None | |
| K | PEEK | | |
| I | API | | |
| C | R-PEEK | $10^{-4} \times \text{rated Cv value} \times 10^{-3}$ or less. | Class IV $\times 10^{-3}$ or less. |
| | R-PEEK (V-port) | $10^{-4} \times \text{rated Cv value} \times 10^{-3} \times 8$ or less. | Class IV $\times 10^{-3} \times 8$ or less. |
| M | SUS316 + Stellite | $10^{-4} \times \text{rated Cv value}$ or less. | Class IV or less. |
| | SUS316 + Stellite (V-port) | $10^{-4} \times \text{rated Cv value} \times 8$ or less. | Class IV $\times 8$ or less. |

INHERENT FLOW CHARACTERISTIC



Range ability

GS-3UU □ V 015 to 032 50:1 (V-port)
 GS-3UU □ - 015 to 080 200:1 (Full port)
 GS-3UU □ R 040 to 150 100:1 (Standard port)

VALVES SPECIFICATIONS

Water
 Oil
 Air, Gas
 Steam
 Chemicals
 Sea water
 Slurry
 Negative pressure

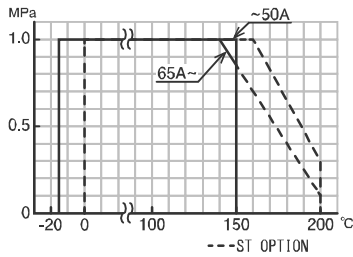
TR LR type

| | | | |
|--------------|---------|--------------------|------------|
| Valve type | | TR LR | |
| Design | | 3-way, Full port | |
| Connection | | JIS10K Flanged-end | |
| Fluid | | | |
| Max pressure | | 1 MPa | |
| Size [mm] | | 020 to 040 | 050 to 100 |
| Material | Body | SCS13A | |
| | Ball | SUS304 | SCS13A |
| | Seat | R-PTFE | |
| Stem seal | Packing | R-PTFE | |
| | O-ring | FKM | |

The optional for steam fluids.

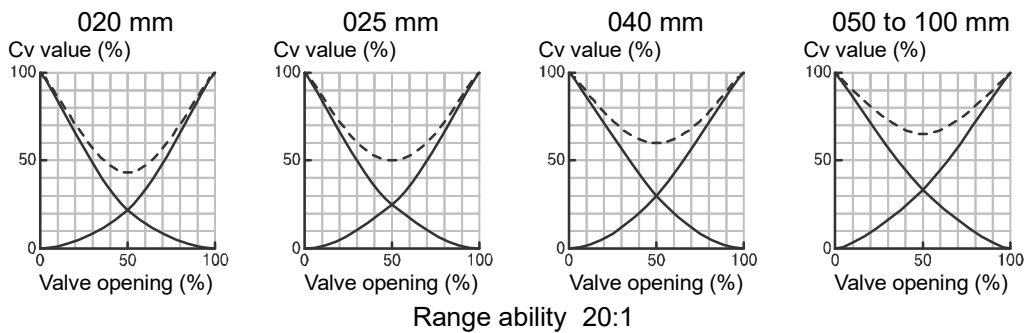
| | | |
|------------|-------------|-------------------------------|
| Valve type | Option code | O-ring |
| TR LR | ST | Replace (Steam resistant FKM) |

PRESSURE & TEMPERATURE RATING

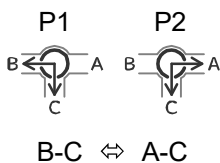


Note) Insulation options are required for use with fluids more than 150 °C.

INHERENT FLOW CHARACTERISTIC



FLOW PATHS (Position① / P1) (Position② / P2)



Note) When a closed path is exposed to high pressure, it may leak slightly to an open path.

VALVES SPECIFICATIONS

Water
 Oil
 Air, Gas
 Steam
 Chemicals
 Sea water
 Slurry
 Negative pressure

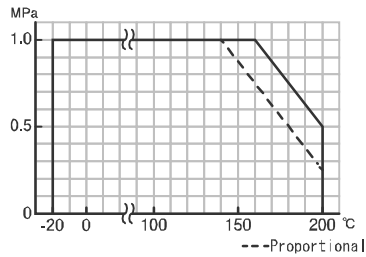
L3 type

| | | |
|--------------|--------------------|--------|
| Valve type | L3 | |
| Design | 3-way, Full port | |
| Connection | JIS10K Flanged-end | |
| Fluid | | |
| Max pressure | 1 MPa | |
| Size [mm] | 025 to 150 | |
| Material | Body | SCS13A |
| | Ball | SCS13A |
| | Seat | R-PTFE |
| Stem seal | Packing | PTFE |

The optional for steam fluids.

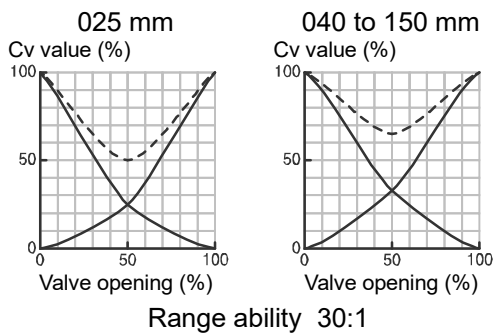
| Valve type | Option code | O-ring |
|------------|-------------|---------------------------|
| L3 | ST-VF | Add (Steam resistant FKM) |

PRESSURE & TEMPERATURE RATING

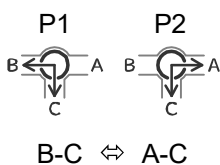


Note) Insulation options are required for use with fluids more than 170 °C.

INHERENT FLOW CHARACTERISTIC



FLOW PATHS (Position① / P1) (Position② / P2)



ELECTRIC ACTUATOR SPECIFICATIONS

3 way valve: SHUT / Position①, OPEN / Position②

AEX type

| Actuator type (□:Voltage code) | AEX-120-□ | AEX-360-□ | AEX-700-□ | AEX-02K-□ | AEX-06K-□ |
|-----------------------------------|---|-----------------------|-----------------------|----------------------------------|-----------------------|
| Voltage | 100 / 110 AC V ±10 % 50/60 Hz (Code: 1) 200 / 220 AC V ±10 % 50/60 Hz (Code: 2) | | | | |
| Rated torque [N·m] | 12 | 36 | 70 | 200 | 600 |
| Operation time [s] | 30 / 25 (50/60 Hz) | 36 / 30 (50/60 Hz) | 72 / 60 (50/60 Hz) | 77 / 64 (50/60 Hz) | 77 / 64 (50/60 Hz) |
| Power consumption [VA] | 9.5 | 13 | | 45 | 220 |
| Motor | Synchronous motor (Triac control) | | | Reversible motor (Triac control) | |
| Overload protection | Timer | | | | |
| Method of operation | Proportional control | | | | |
| Input signal | 4 to 20 mA / 1 to 5 V (Input resistance: 250 Ω) (Standard) 0 to 5 V / 0 to 10 V / 2 to 10 V (Input resistance: more than 1 M Ω) 0-135 Ω to 0-1 kΩ Potentiometer input (Applied voltage: 5 V DC) | | | | |
| Operation *1 | [Mode A] SHUT by decreased signal (Standard) OPEN by increased signal [Mode B] SHUT by increased signal OPEN by decreased signal [Forced open / shut] It takes priority over the input signal. C-S is ON → SHUT. (Common in mode A / B) C-O is ON → OPEN. | | | | |
| Indication signal | 0 mA : SHUT ↔ 1 mA : OPEN (External load resistance: less than 3 kΩ) Common in mode A / B | | | | |
| Override switch | It takes priority over the input signal. Common in mode A / B Dry contact / Transistor, Open collector. (Input signal current: 6 mA 15V DC) | | | | |
| Operating range | SHUT: 0 to 40% OPEN: 50 to 100% | | | | |
| Resolution | Less than 0.2% | | | | |
| Duty cycle | 100 % | | | | |
| Ambient temperature | -20 to 55°C | | | | |
| Space heater | 2 W | | | | |
| Manual operation | Manual shaft | | | | |
| Enclosure | Equivalent to IP65 (IEC 60529) | | | | |
| Housing material | Aluminum alloy die cast (acrylic resin baking finish) | | | | |
| Wire connection | Terminal Block: M3, Ground terminal: M3 | | | | |
| Conduct port | 2-G1/2 Attachments: Cable gland (for Φ6 to 12 mm cable), plug. | | | | |

*1 Change by DIP switch. (Standard → Potentiometer input or 0 to 5 V / 0 to 10 V / 2 to 10 V)

*2 Change by DIP switch. (Standard → Mode B)

ELECTRIC ACTUATOR SPECIFICATIONS

3 way valve: SHUT / Position①, OPEN / Position②

WIRING

AEX

Setting with DIP SW

- Operation

| Mode A | Mode B |
|--------|--------|
| ON OFF | ON OFF |
| 4 | 4 |
| 3 | 3 |
| 2 | 2 |
| 1 | 1 |
- Input signal

| |
|--------|
| ON OFF |
| 4 |
| 3 |
| 2 |
| 1 |

4 to 20 mA / 1 to 5 V

0-135 Ω to 0-1 kΩ Potentiometer input / 0 to 5 V

| |
|--------|
| ON OFF |
| 4 |
| 3 |
| 2 |
| 1 |

0 to 10 V

| |
|--------|
| ON OFF |
| 4 |
| 3 |
| 2 |
| 1 |

2 to 10 V

Note

- Input signal circuit is non-isolated. Do not connect DC (minus) wire to other DC (minus) common.
- Do not adjust the "O-L" and "S-L" trimmer. It is adjusted at the factory.

ADJUSTMENT OF ACTUATOR

AEX

- ① **Dead band**
Turn the trimmer clockwise for wide the dead band as necessary. It is useful to prevent the hunting reaction of actuator. *Each trimmer on a built-in control board.
- ② **Operating range**
Turn clockwise and adjust valve / damper to open side.
 - Adjust the closed position by SHUT trimmer.
 - Adjust the open position by OPEN trimmer.

ELECTRIC ACTUATOR SPECIFICATIONS

3 way valve: SHUT / Position①, OPEN / Position②

PEX type

| Actuator type (□:Voltage code) | PEX-120-□ | PEX-300-□ | PEX-700-□ |
|-----------------------------------|---|-----------------|-------------------|
| Voltage | 100 to 240 V AC $\pm 10\%$ 50/60 Hz (Code: 6) 24 V DC $+20\% \sim -10\%$ (Code: 0) Cannot use a half or full-wave DC power supply. | | |
| Rated torque [N·m] | 10 | 21 | 50 |
| Operation time [s] | 2.5 to 4 (Max 12) | 6 to 9 (Max 34) | 12 to 18 (Max 68) |
| | The operation time is the time when it is operated by the override switch. Operation time with the override switch cannot be adjusted with S.C. trimmer. At factory shipment, the S.C trimmer is set to the fastest position. | | |
| Power consumption [VA] | AC power 80 DC power 50 | | |
| Motor | Brushless DC motor (PWM Control) | | |
| Overload protection | Current limiter | | |
| Method of operation | Proportional control | | |
| Input signal | 4 to 20 mA / 1 to 5 V (Input resistance: 250 Ω) | | |
| Operation *1 | [Mode A] SHUT by decreased signal (Standard) OPEN by increased signal [Mode B] SHUT by increased signal (Option: J) OPEN by decreased signal [Forced open / shut] It takes priority over the input signal. C-S is ON \rightarrow SHUT. (Common in mode A / B) C-O is ON \rightarrow OPEN. | | |
| Indication signal | 0 mA : SHUT \leftrightarrow 1 mA : OPEN (External load resistance: less than 3 k Ω) Common in mode A / B | | |
| Override switch | It takes priority over the input signal. Common in mode A / B Dry contact / Transistor, Open collector. (Input signal current: 6 mA 15V DC) | | |
| Operating range | SHUT: 0 to 40 % OPEN: 50 to 100 % | | |
| Resolution | Less than 0.2 % | | |
| Duty cycle | 100 % | | |
| Ambient temperature | -20 to 55 $^{\circ}$ C | | |
| Space heater | 3 W | | |
| Manual operation | Manual shaft | | |
| Enclosure | Equivalent to IP65 (IEC 60529) | | |
| Housing material | Aluminum alloy die cast (acrylic resin baking finish) | | |
| Wire connection | Terminal Block: M3, Ground terminal: M3 | | |
| Conduct port | 2-G1/2 Attachments: Cable gland (for $\Phi 6$ to 12 mm cable), plug. | | |

*1 Change by DIP switch. (Standard \rightarrow Mode B)

ELECTRIC ACTUATOR SPECIFICATIONS

3 way valve: SHUT / Position①, OPEN / Position②

WIRING

PEX

Setting with DIP SW

- Operation

| | |
|-------------------|--------|
| Mode A (Standard) | Mode B |
| | |

Note

- Do not adjust the "O-L" and "S-L" trimmer. It is adjusted at the factory.
- Minus terminal can be used in common, but T2 terminal for DC power supply is not a common terminal.

ADJUSTMENT OF ACTUATOR

PEX

- ① **Dead band**
Turn the trimmer clockwise for wide the dead band as necessary. It is useful to prevent the hunting reaction of actuator. *Each trimmer on a built-in control board.
- ② **Operating range**
Turn clockwise and adjust valve/damper to open side.
 - Adjust the closed position by SHUT trimmer.
 - Adjust the open position by OPEN trimmer.
- ③ **Operating speed (Speed control)**
Slow by turn the S.C. trimmer counterclockwise.
Fast by turn the S.C. trimmer clockwise.

Note) The operation time is the time when it is operated by the override switch.
Operation time with the override switch cannot be adjusted with S.C. trimmer.
At factory shipment, the S.C trimmer is set to the fastest position.

ELECTRIC ACTUATOR SPECIFICATIONS

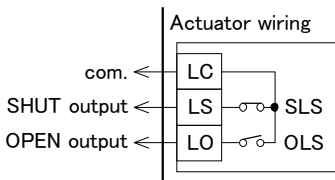
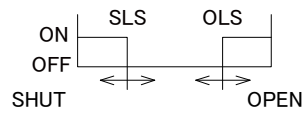
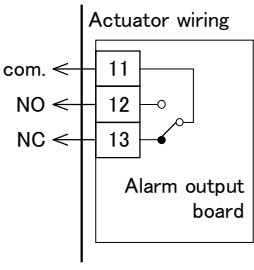
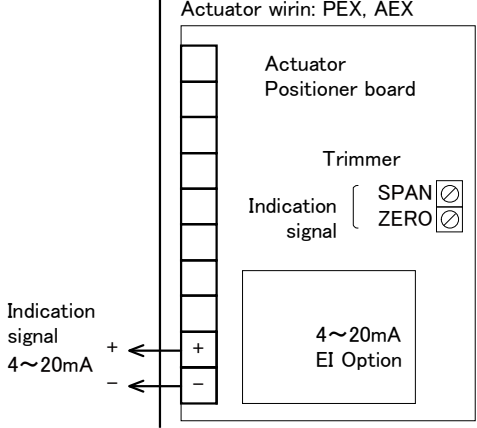
3 way valve: SHUT / Position①, OPEN / Position②

OPTIONAL PARTS

| Specifications | Code No. | AEX | PEX | Remarks | |
|--|---|-----|-----|------------------------------------|-------------------|
| Input signal and operation | 4 to 20 mA or 1 to 5 V | Nil | ○ | ○ | Mode A (Standard) |
| | | J | ○ | ○ | Mode B |
| | 0-135 Ω to 0-1 kΩ Potentiometer input or 0 to 5 V | F | ○ | | Mode A |
| | | K | ○ | | Mode B |
| | 0 to 10 V | G | ○ | | Mode A |
| | | N | ○ | | Mode B |
| | 2 to 10 V | H | ○ | | Mode A |
| M | | ○ | | Mode B | |
| Auxiliary limit switch (Select limit switch depending on the load) | L0 | ○ | ○ | For standard signal | |
| | L2 | ○ | ○ | For micro load signal | |
| Alarm output board | EA | ○ | ○ | EI and EA cannot be used together. | |
| 4 to 20 mA Indication signal board | EI | ○ | ○ | | |

*Auxiliary limit switch: Please refer to the specifications.

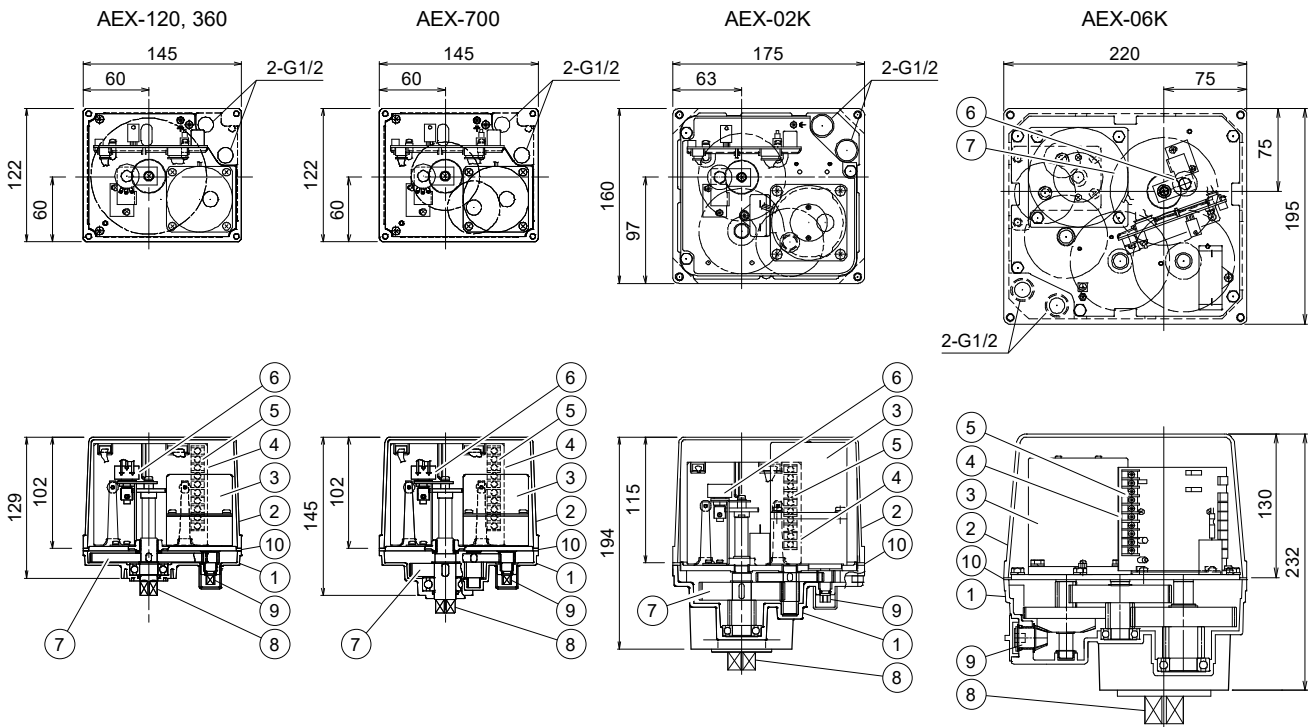
WIRING (OPTION)

| L0, L2 | Auxiliary limit switch | EA | Alarm output board | EI | 4 to 20 mA Indication signal board |
|--------|--|----|---|----|---|
| |  <p>At CLOSE side, LC and LS is ON. At OPEN side, LC and LO is ON.</p>  <p>ON point can be reset by adjusting the cam.</p> | |  <p>NO : Normally open NC : Normally closed</p> <p>Alarm SW will be ON, when overload protector works.</p> <p>Error → 11 and 12 is ON. Normal → 11 and 13 is ON.</p> <p>Cannot be used with EI option.</p> | |  <p>EI option board output an isolated indication signal from the plus and minus terminal with 4 to 20 mA by AEX / PEX positioner board.</p> |

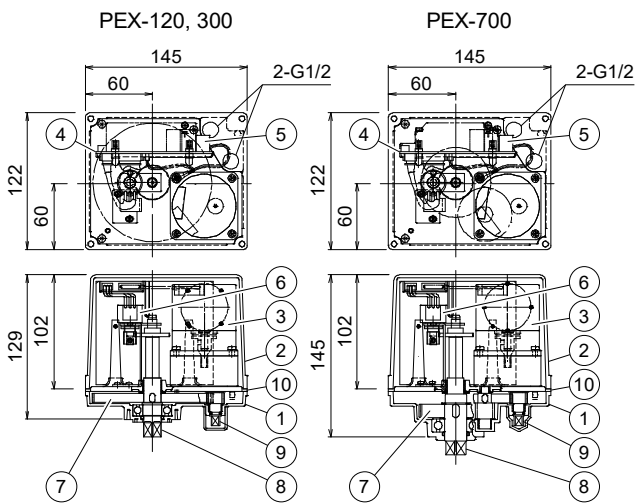
ELECTRIC ACTUATOR SPECIFICATIONS

DIMENSIONS

AEX



PEX



Parts name

| | | | | | | | |
|---|-------------|---|----------------|---|--------------|----|----------------|
| 1 | Body | 4 | Control board | 7 | Drive gear | 10 | Rubber packing |
| 2 | Motor cover | 5 | Terminal block | 8 | Drive shaft | | |
| 3 | Motor | 6 | Potentiometer | 9 | Manual shaft | | |

INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS

HANDLING & STORAGE

①HANDLING

Do not drop or throw the product as it may break.

②STORAGE

- Store away from dust, moisture and direct sunlight. If possible, store in the original package.
- Do not remove a dust proof cap until the piping.

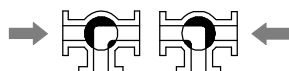
③CHECKING

- Check the product code, power supply, and voltage before installation.
- Make sure that the bolts are not loose.
- The DIP switch should be set up before the power is turned on. Do not touch unnecessary switches.

INSTALLATION

①PRECAUTIONS

- Flush the pipeline carefully before installing the valve. Foreign particles, such as sand or pieces of welding electrode, will damage the ball and seats.
- For valves with specified flow direction (GS, VR) or with ST / SC option, check the arrows on the product before piping.
- When the flow path is subjected to a high pressure from arrow, it may leak slightly to the low pressure port. (TR, LR)



②PIPING FLANGES

- Gasket should be selected appropriately to suit the fluid, pressure and temperature. Use spring washer to prevent from decreasing surface pressure gasket when the temperature change happens frequently.
- Tighten all bolts using crossover method to load the joint evenly.
- Wafer type ball valve is put between two seats of flanged-end and tightened with long bolts. (BS, GS)

③ENVIRONMENT

- Do not install in place where corrosive gas is present or where vibration is heavy (0.5 G or more).
- When radiant heat causes the surface temperature of the control unit to exceed 55 °C, provide an appropriate shielding plate.
- If there is a possibility that the fluid and drive part freeze, please take measures to prevent freezing.

④POSITIONING

Should be positioned through 90° upward from horizontal. Provide space around the product to allow manual operation, inspection and replacement work.

Maintenance space for upper part of actuator.

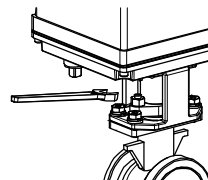
| | | |
|-----------------------|-----|------------------|
| AEX (120 / 360 / 700) | PEX | More than 105 mm |
| AEX (02K / 06K) | | More than 120 mm |

⑤OTHER NOTES

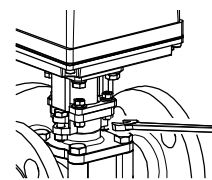
Until the wiring is completed there must be no condensation or flooding in the interior of the actuator, after piping. Protective caps on the cable gland are not waterproof.

⑥CAUTIONS FOR MAINTENANCE (GS, L3)

Do not keep warm for maintenance of the valve gland.



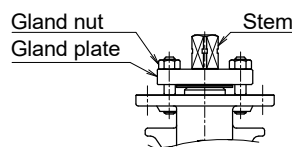
GS



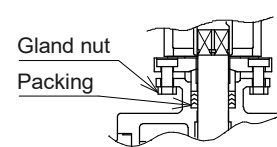
L3

TIGHTEN THE GLAND NUTS (GS, L3)

- Check that there is no leakage from the gland packing.
- If it leakage, tighten gland nuts by alternately. Do not over-tighten the gland nuts.



GS



L3

| | Valve size [mm] | | | Recommended torques [N·m] |
|--------------|-----------------|--------------|------------|---------------------------|
| | GS | | L3 | |
| V015 V020 | 015 020 | - | - | 2 |
| V025 V032 | 025 032 | R040 | 025 | 3.5 |
| - | 040 050 | R050 R065 | 040 050 | 7 |
| - | 065 080 | R080 R100 | 065 080 | 10 |
| - | - | R125 R150 | 100 125 | 14 |
| - | - | - | 150 | 20 |

INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS**WIRING****①PRECAUTIONS**

- Remove the actuator cover before wiring.
- Two G1/2 electrical connections are provided with a cable gland and plug. Usable cable size is $\Phi 6$ to 12 mm.
- When using a flexible tube, dew condensation may occur inside the actuator due to respiration from the inside of the tube and malfunction may result. Seal the flexible tube connector part with a sealant.
- Sealants that affect the electrical contacts should not be used inside the electric actuator.
- If long distance wiring or low voltage operation, check that terminal voltage is in the proper range.
- AEX type input signal circuit is non-isolated. Do not connect DC (minus) wire to other DC (minus) common.
- PEX type minus terminal can be used in common, but T2 terminal for DC power supply is not a common terminal.

②CONNECTION

- Do not wiring outdoors on a rainy day.
- Check the power supply and voltage. Connect the signal as shown in the wiring diagram. Do not connect unnecessarily terminal.
- Check whether the MODE change DIP SW on a circuit board substrate is set up correctly.
- When wiring, if wiring of a signal is mistaken, it will not operate correctly. Contact us when you use two valve or more by one controller or indicator.
- Actuator should be electrically grounded. Use the terminal marked (\oplus) inside the actuator.

PREVENT DEW CONDENSATION

- When installing the cover after wiring, perform the bolt by the temporary tightening procedure and the permanent tightening procedure to tightly and securely tighten the rubber packing so that water does not enter from the outside.
- Tighten the cable gland nut so that there is no leakage from the wire entrance.

CONTROL**①INPUT SIGNAL**

- Use shielded wire for signal wiring where high level noise is generated or when the wiring distance is long.
- Control with a 1 to 5 V input signal becomes an input resistance 250 Ω . Provide a voltage that can safely 20mA or more than.

②DC POWER SUPPLY

- Cannot use a half or full-wave power supply.
- Consider an inrush current of motor. (It is 1.5 to 3 times of consumed current.)
- When using a DC voltage, be selected the wire thickness by the wiring distance.
- Do not use power supply that require more than 1 second with rise and fall time.

③INPUT SIGNAL AND OPERATION MODE

The input signal and operation mode are set as follows. (Factory shipped)

| | |
|----------------|--|
| Input signal | 4 to 20 mA or 1 to 5 V |
| Operation mode | Mode A |
| Operation | SHUT by decreased signal. OPEN by increased signal. |

OPERATION**①TESTING**

- Make sure that power supply voltage is correct. Also check operating position, wiring, speed and signals.
- During trial operation, check that valve movement and output signal are correct.

②CONFIRM THE OPERATING CONDITION

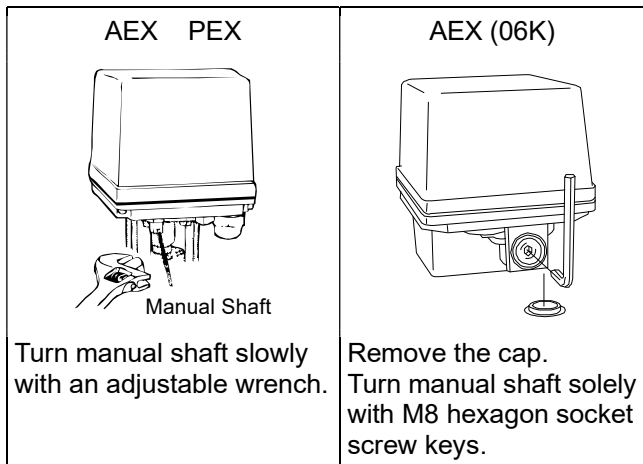
- Adjust fluid condition, controller setting, sensor etc. so that stable control is achieved.
- When used in an unstable control state, the life of the actuator and the valve will be shortened.
- The desired control state is stable at the target value. Adjust the PID setting value of the controller when overshooting the target value greatly, when not converging for a long time or hunting operation. Also, when the time delay is large, please consider the sensor position.

③ATTENTION

- Do not change an unnecessary dip switch.
- Keep power supplied for built-in space heater to prevent condensation inside actuator.
- Do not touch the moving parts of actuator in operation.
- Never put anything on the actuator or make it into a foothold.

INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS**MANUAL OPERATION****①PRECAUTIONS**

- Be sure to turn off the power before manual operation.
- Operate manually with reference to the opening degree label. Do not turn beyond the fully open / fully closed position. Operation failure may occur during automatic operation.

②THE WAY OF OPERATION

Before automatic operation, be sure to remove the wrench.

MAINTENANCE

- To prevent electric shock, be sure to turn off the power when removing the actuator cover.
- Do the routine maintenance at least once in half a year.

Inspection items

- Confirm operation of opening and closing.
- Confirm that an actuator is not hot excessively.
- Confirm existence of abnormal noise and vibration during operation.
- Confirm whether screws are loose or not.
- Confirm that water or condensation no remains in the actuator.
- Confirm the fluid temperature or pressure.
- Confirm the leak from valve stem.
- Confirm the bolt tightening torque.

INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS

TROUBLE SHOOTING

| Problem | Cause | Solution |
|-------------------------|--|---|
| Actuator does not move. | Faulty wiring. | Correct the wiring. |
| | Voltage and input signal are not coming. | Check the voltage and input signal. |
| | Incorrect voltage. | When it's burned out by excess voltage, replace the actuator. |
| | Connection or wiring is not correct. | Correct the miswiring and misconnection. Be careful not to mistake the plus and minus of wiring. |
| | Short the circuit, contact failure. | Review wires and connection. |
| | Motor is too old. | Replace the actuator. Repair in our factory. |
| Operation is unstable. | Excess surge or voltage was applied. | <ul style="list-style-type: none"> • Replace the control board or limit switch. (Repair in our factory) • Replace the actuator. |
| | Rainwater entered the actuator. | <ul style="list-style-type: none"> • Dry the inside. • Replace the actuator. |
| | Added high harmonics noise from an inverter. | Attachment a filter for each inverter maker option. |
| | Effect of high level noise. | Use the shielded wire and ground the wiring. Separate signal wire from power line. |

| Problem | Cause | Solution |
|---|---|--|
| Stop in the mid position. (Input signal 1 to 5 V) | Signal voltage source capacity shortage. | Use a voltage source that can be made to flow more than 20 mA. Please contact us. |
| Stop in the mid position. | <ul style="list-style-type: none"> • Biting of valve seat. • The scale has adhered to the valve ball. | Remove a foreign object. |
| | Overload protector runs because of over-torque. | Motor protection circuit returns by the signal of operation of an opposite direction. Turn on the power again. |
| Alarm LED is lit. | | |
| Leakage from valve body | <ul style="list-style-type: none"> • Valve cap get loose. • Valve body is damaged. | Replace the valve. |
| Leakage from valve seat | Seat is worn or damaged. | Replace the valve. |
| | | Replace the valve seat. |
| Leakage from valve stem | Stem packing is worn or distorted. | Replace the valve. |
| | | Replace the packing. |
| Leakage from valve gland GS L3 | Gland packing is worn or distorted. | Tighten the gland nut. |
| | | Replace the gland packing. |

For more information contact
NIPPON VALVE CONTROLS, INC. for consultation.